$A + B + C = 2 \quad \cdots (i)$

$A + 4B - C = -9 \quad \cdots (ii)$

$A - 6A + 3B - 2C = -35 \quad \cdots (iii)$

i) $A + B + C = 2$

ii) $\underline{A + 4B - C = -9}$

Add $2A + 5B = -7 \quad \cdots (iv)$

iii) $-6A + 3B - 2C = -35$

$\underline{2A + 2B + 2C = 4}$

Add $-4A + 5B = -31 \quad \cdots (v)$

iv) $2A + 5B = -7$

v) $\underline{-4A + 5B = -31}$

$6A = 24$

$A = 24/6$

$A = 4$

Substituting $A = 4$ in (iv)

$2(4) + 5B = -7$

$8 + 5B = -7$

$5B = -7 - 8$

$5B = -15$

$B = -3$

Substituting $A = 4$ and $B = -3$ in (i)

$4 + (-3) + C = 2$

$1 + C = 2$

$C = 1$

$$\int \frac{2x^2 - 9x - 35}{(x+1)(x-2)(x+3)}\,dx = \int \frac{4}{x+1}\,dx + \int \frac{-3}{x-2}\,dx + \int \frac{1}{x+3}\,dx$$

$= 4\ln(x+1) - 3\ln(x-2) + \ln(x+3)$

3.) $\int \frac{1}{x^2+121}\,dx = \int \frac{dx}{x^2+11^2}$

$x = 11\tan\theta$

$dx = 11\sec^2\theta\,d\theta$

$x^2+11^2 = 11^2\tan\theta + 11^2$

$= 11^2(\tan^2\theta + 1)$

$= 121\sec^2\theta$

$\int \frac{11\sec^2\theta}{121\sec^2\theta}\,d\theta$

$= \int \frac{d\theta}{11}$

$= \frac{1}{11}\int d\theta$

$= \frac{1}{11}[\theta) + C$

$= \frac{1}{11}\tan^{-1}\frac{x}{11} + C$

$= \frac{\tan^{-1} x/11}{11} + C$

Mechanical Engineering

Favour Akparanta 19/ENG06/005 MAT 104

Integrate the following with respect to their variable

1.) $\int \frac{(11-3x)}{x^2+2x-3} = \frac{11-3x}{x^2+2x-3} \cdot \frac{A}{(x+3)(x-1)} \quad \frac{11-3x}{(x+3)(x-1)} = \frac{A}{(x+3)} + \frac{B}{(x-1)} = \frac{A(x-1)+B(x+3)}{(x+3)(x+1)}$

$11-3x = A(x-1)+B(x+3)$

at $x=1$

$B(4) = 11-3$

$B = 2$

at $x=3$

$A(2) = 11-9$

$A = 1$

$= \int \frac{1}{(x+3)} dx + \int \frac{2}{(x-1)} dx = \int \frac{11-3x}{x^2+2x-3} dx$

$\int \frac{dx}{x+3} + \int \frac{2dx}{x+1} = \int \frac{11-3x}{x^2+2x-3} dx$

$= \ln u + 2\ln u$

$= \ln(x+3) + 2\ln(x-1)$

2.) $\int \frac{2x^2-9x-35}{(x+1)(x-2)(x+3)} dx$

$\frac{2x^2-9x-35}{(x+1)(x-2)(x+3)} = \frac{A}{(x+1)} + \frac{B}{(x-2)} + \frac{C}{(x+3)}$

$= \frac{A(x-2)(x+3)+B(x+1)(x+3)+C(x+1)(x-2)}{(x+1)(x+2)(x+3)}$

$2x^2-9x-35 = A(x^2+x-6)+B(x^2+4x+3)+C(x^2-x-2)$

$= Ax^2+Ax-6A+Bx^2+4Bx+3B+Cx^2-Cx-2C$

$= Ax^2+Bx^2+Cx^2+Ax+4Bx-Cx-6A+3B-2C$

$2x^2-9x-35 = (A+B+C)x^2+(A+4B-C)x+(-6A+3B-2C$